Recent Adavances in the Analytical Chemistry of Cadaveric Decomposition

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The chemical processes of human cadaver decomposition are complex and not well understood. The study of decomposition chemistry aims to elucidate the postmortem processes, particularly relating to the production of volatile organic compounds (VOCs) throughout the various decomposition stages [1]. The study of human remains (HR) decomposition chemistry is further motivated by the need for developing specific tools to locate dead or injured bodies during mass disaster victim recovery cases, for forensic investigations, and the search for clandestine graves. Over the last few years, the use of thermal desorption coupled with comprehensive two-dimensional gas chromatography time-of-flight mass spectrometry (TD-GC×GC-TOFMS) has allowed partial elucidation of cadaveric VOC profiles [2]. GC×GC-TOFMS is a powerful Separation Science tool that combines advantages from the added peak capacity and zone compression of GC×GC and from the deconvolution of mass spectral signals of high resolution TOFMS offering accurate mass measurements for proper analyte identity assignments. The collection of exhaustive data sets including first and second retention time values (^1t_R and ^2t_R), intensities, mass spectra, accurate mass values,… however results in the production of large files that require specific treatment before they can be exploited [3]. On the top of basic spectral alignment and normalization, supervised and non-supervised statistics have to be used to extract the relevant information from the multidimensional perspective [4].

This lecture will illustrate how such data can be produced and used in specific forensic chemistry situations such as training of HR detection (HRD) canines [5], search for dead bodies [6], cadaveric internal gas reservoir analyses for postmortem interval (PMI) determination [7], case studies, …

References

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